WHAT IS CLAIMED IS:

1. An ultra-wideband receiver comprising:

a filter coupled to a signal input, the filter to pass signals in a frequency band from a received signal provided by the signal input;

an amplifier coupled to the filter, the amplifier to bring the passed signals to a signal level compatible with circuitry in the receiver;

a demodulating unit coupled to the amplifier, the demodulating unit containing circuitry to bring the passed signals to an internal frequency;

a timing generating unit coupled to the demodulating unit, the timing generating unit containing circuitry to generate samples of the passed signals at different timing offsets; and

a converter coupled to the timing generating unit, the converter to convert continuous samples produced by the timing generating unit into discrete samples.

2. The ultra-wideband receiver of claim 1, wherein the demodulating unit further contains circuitry to provide in-phase and quadrature phase signal streams from the passed signals.

3. The ultra-wideband receiver of claim 2, wherein the demodulating unit further contains amplifiers to variably adjust the gain of the in-phase and quadrature phase signal streams.

4. The ultra-wideband receiver of claim 1, wherein the timing generating unit comprises a pair of sample/hold circuits having inputs coupled to the demodulating unit, and wherein a first sample/hold circuit produces an on-time sample and a second sample/hold circuit produces an early and a late sample.

5. The ultra-wideband receiver of claim 4, wherein the demodulating unit provides in-phase and quadrature phase signal streams, and wherein the timing generating unit comprises a pair of sample/hold circuits for each signal stream.

6. The ultra-wideband receiver of claim 1, wherein the timing generating unit produces on-time, early, and late samples, and wherein the converter comprises a pair of analog-to-digital converters (ADC), wherein a first ADC converts the on-time samples and a second ADC converts the early and late samples.

7. The ultra-wideband receiver of claim 6, wherein the first ADC has a higher resolution than the second ADC.

8. The ultra-wideband receiver of claim 1 further comprising an interference mitigating circuit having an input coupled to the amplifier and an output coupled to the demodulator, the interference mitigating circuit comprising:

a down-conversion unit to bring an interference band within the received signal down to baseband; and

a high-pass filter coupled to the down-conversion unit, the high-pass filter to eliminate the interference band located at baseband.

9. The ultra-wideband receiver of claim 8, wherein there is an interferer located within a frequency band of 5.15 GHz to 5.85 GHz, wherein the down-conversion unit is a mixer with a carrier frequency of approximately 5.5 GHz, and wherein the high-pass filter has a cutoff frequency at approximately 350 MHz.

10. The ultra-wideband receiver of claim 1 further comprising a digital baseband circuit, the digital baseband circuit comprising:

a despreading unit to remove a spreading code applied to a transmitted signal;

an adjust timing circuit coupled to the despreading unit, the adjust timing circuit containing circuitry to control sampling of the converter;

a multipath processing unit coupled to the despreading unit, the multipath processing unit containing circuitry to combine multiple copies of the transmitted signal in the signals into a single signal; and

a decoding unit coupled to the multipath processing unit, the decoding unit containing circuitry to remove encoding present in the single signal.

11. The ultra-wideband receiver of claim 10, wherein the despreading unit comprises a pair of despreaders, one for an in-phase and one for a quadrature phase signal stream.

12. The ultra-wideband receiver of claim 10, wherein the despreading unit further provides timing information.

13. The ultra-wideband receiver of claim 12, wherein the adjust timing circuit uses timing information from the despreading unit to adjust converter sampling.

14. The ultra-wideband receiver of claim 10 further comprising an automatic gain control (AGC) coupled to the despreading unit, wherein the AGC controls amplifiers to variably adjust the gain of the signal stream.

15. The ultra-wideband receiver of claim 10, wherein the multipath processing unit comprises:

a rake receiver containing a plurality of tracking fingers, each tracking finger to independently track a copy of the transmitted signal;

a channel estimation unit coupled to the rake receiver, the channel estimation unit containing circuitry to provide a delay spread profile of the received signal; and

a carrier phase tracking unit coupled to the rake receiver, the carrier phase tracking unit containing circuitry to provide phase error information.

16. The ultra-wideband receiver of claim 10, wherein the decoding unit implements a Viterbi decoder.

17. The ultra-wideband receiver of claim 10 further comprising an equalizer coupled to the multipath processing unit and the decoding unit, the equalizer to help mitigate inter-symbol interference.

18. The ultra-wideband receiver of claim 17, wherein the equalizer is an adaptive equalizer.

19. The ultra-wideband receiver of claim 17, wherein the equalizer is a non-adaptive equalizer.

20. An ultra-wideband transmitter comprising:

an encoding unit coupled to a data source, the encoding unit containing circuitry to apply a code to data provided by the data source;

a spreading unit coupled to the encoding unit, the spreading unit containing circuitry to apply a spreading code to the data;

a pulse shaping unit coupled to the spreading unit, the pulse shaping unit containing circuitry to apply mask of a desired pulse with desired frequency characteristics to the encoded and spread data;

a modulating unit coupled to the pulse shaping unit, the modulating unit apply a carrier frequency to the shaped, encoded, and spread data; and

a filter coupled to the modulating unit, the filter to ensure that the modulated, shaped, encoded, and spread data fit within a desired frequency range.

21. The ultra-wideband transmitter of claim 20, wherein the encoding unit is a convolutional encoder.

22. The ultra-wideband transmitter of claim 20, wherein the spreading unit multiplies the data with a spreading code with a specified spreading gain.

23. The ultra-wideband transmitter of claim 22, wherein the spreading code has a period that is larger than the specified spreading gain.

24. The ultra-wideband transmitter of claim 23, wherein the period is significantly larger than the specified spreading gain.

27. An ultra-wideband device comprising:

an antenna to transmit and receive signals;

a switch coupled to the antenna, the switch to control access to the antenna;

a receiver coupled to the switch, the receiver comprising

a filter coupled to the switch, the filter to pass signals in a frequency band from a received signal provided by the switch;

an amplifier coupled to the filter, the amplifier to bring the passed signals to a signal level compatible with circuitry in the receiver;

a demodulating unit coupled to the amplifier, the demodulating unit containing circuitry to bring the passed signals to an internal frequency;

a timing generating unit coupled to the demodulating unit, the timing generating unit containing circuitry to generate samples of the passed signals at different timing offsets; and

a converter coupled to the timing generating unit, the converter to convert continuous samples produced by the timing generating unit into discrete samples;

the ultra-wideband device further comprising a transmitter coupled to the switch, the transmitter comprising

an encoding unit coupled to a data source, the encoding unit containing circuitry to apply a code to data provided by the data source;

a spreading unit coupled to the encoding unit, the spreading unit containing circuitry to apply a spreading code to the data;

a pulse shaping unit coupled to the spreading unit, the pulse shaping unit containing circuitry to apply mask of a desired pulse with desired frequency characteristics to the encoded and spread data;

25. The ultra-wideband transmitter of claim 20, wherein the pulse shaping unit comprises:

a sampler to upsample the encoded and spread data by a specified amount; and

a filter coupled to the sampler, the filter having a frequency response of the desired pulse.

26. The ultra-wideband transmitter of claim 25, wherein the filter has the frequency response of a square-root raised cosine (SRRC) pulse.

a modulating unit coupled to the pulse shaping unit, the modulating unit to apply a carrier frequency to the shaped, encoded, and spread data; and

a filter coupled to the modulating unit and the switch, the filter to ensure that the modulated, shaped, encoded, and spread data fit within a desired frequency range.

28. The ultra-wideband device of claim 27, wherein the desired pulse is a square-root raised cosine (SRRC) pulse.

29. The ultra-wideband device of claim 28, wherein the SRRC pulse has a frequency bandwidth that is a fraction of available ultra-wideband bandwidth.

30. The ultra-wideband device of claim 27, wherein the device avoids transmitting in frequency bands of known interferers.

31. The ultra-wideband device of claim 30, wherein the device transmits in the frequency bands of known interferers when they are absent.

32. The ultra-wideband device of claim 27, wherein the device transmits in a portion of available ultra-wideband bandwidth, and wherein when multiple ultra-wideband devices are present, each ultra-wideband device can transmit in a different portion of the ultra-wideband bandwidth.